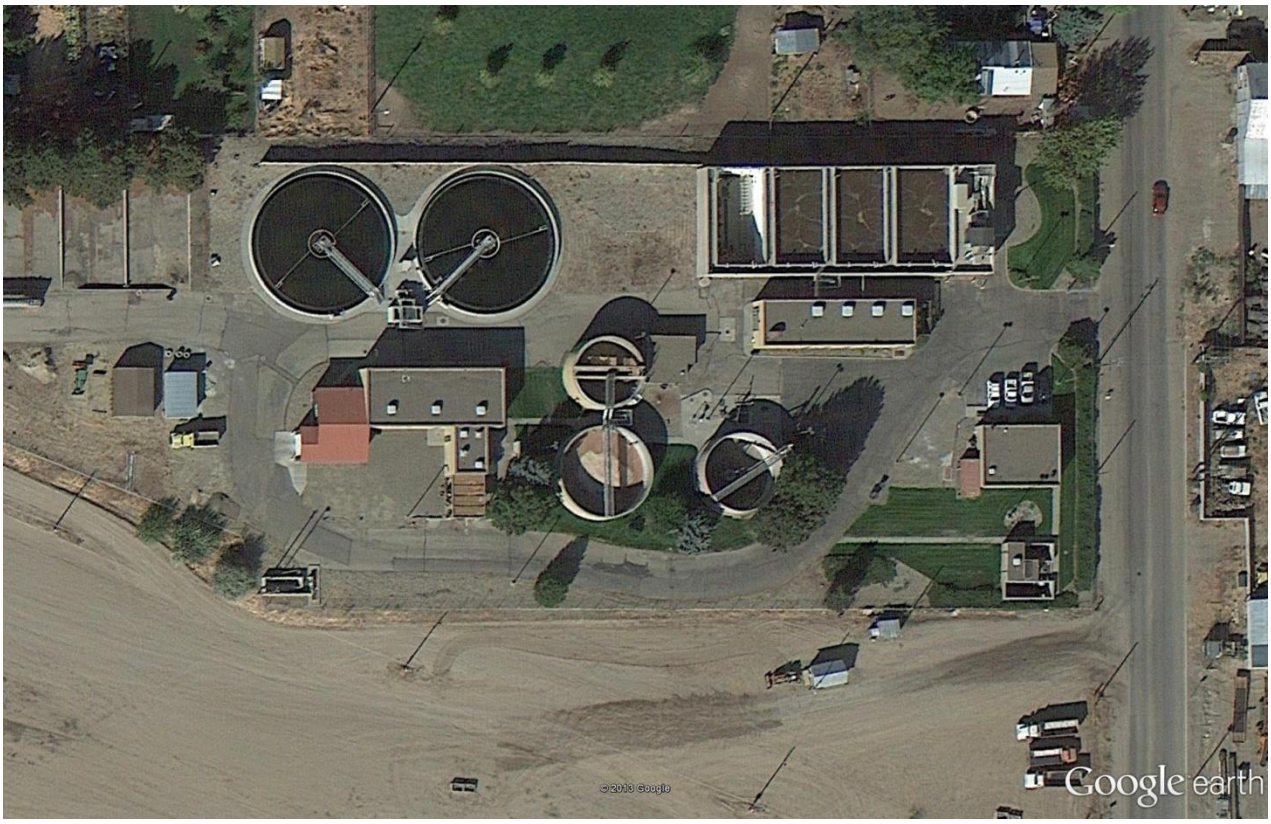
Clean Water State Revolving Fund Green Project Reserve
- Interim -



City of Weiser WWTP Upgrade Project
SRF Loan #WW1304
$6,000,000

Interim Green Project Reserve Justification

Categorical GPR Documentation

1. INSTALL NEW FINE BUBBLE DIFFUSED AERATION SYSTEM WITH HIGH SPEED SCREW COMPRESSORS (Energy Efficiency). Categorical GPR per Section 3.2-2: *projects that achieve a 20% reduction in energy consumption; retrofits to compare existing system to that proposed…New POTW projects or capacity expansion projects should be designed to maximize energy efficiency and should select high efficiency premium motors and equipment where cost effective."* ($970,000).
2. INSTALL NEW ENERGY-EFFICIENT PREMIUM MOTORS ON WATER REUSE PUMPS. Categorical per GPR 3.2-2: *projects that achieve a 20% reduction in energy consumption* ($151,000).

Business Case GPR Documentation

3. INSTALL SCADA SYSTEM (Energy Efficiency). Business Case GPR per 3.5-8: *SCADA systems can be justified based on substantial energy savings.* ($150,000).

State of Idaho SRF Loan Program
April 2014

1. Treatment Process – Aeration System

Summary

- Large-scale wastewater plant improvement project includes upgrades to the aeration system.
- Total Loan amount = $6,000,000
- Estimated Categorical energy efficient (green) portion of loan = 16.2% ($970,000)
- Annual Energy savings = 48.5%

Background[1]

- The City of Weiser's Wastewater Treatment Plant currently services approximately 5,500 people and includes 1,775 residential and 186 commercial connections as of fiscal year 2013.
- The City faces changing effluent discharge conditions in the Snake River and new regulatory requirements driven by water quality impairment in the Snake.
- Current treatment processes include activated sludge process tanks, and aerobic digestion tanks. Aeration is currently provided by five (5) positive displacement air compressor blowers.
- The estimated energy consumed by the aerobic treatment system required to meet new regulatory requirements without implementing energy-efficient improvements is 1,175,260 kW-hr per year.

Proposed Upgrades

- Two of the five existing positive displacement air compressors will be replaced with two energy-efficient screw compressor blowers; both will be equipped with VFDs. Another of the existing positive displacement air compressor blowers will be equipped with a VFD.
- The blowers will be equipped with dissolved oxygen probes, air flow control valves, and air flow meters that will adjust blower speed based on continuous oxygen concentration readings from dissolved oxygen sensors that will be installed.
- The existing coarse bubble diffusers will be replaced with fine bubble membrane diffusers that greatly enhance the oxygen transfer and efficiency of the aeration process.
- The 4th aeration tank will be equipped with an oxygen probe and mechanical mixer that will be activated when oxygen demand drops below a certain threshold so the aeration to this tank can be shut off completely. This prevents the blowers from running continuously to keep the 4th aeration tank mixed.
- In the Digester, additional diffusers will be added and existing diffusers reorganized to improve aeration efficiency. Oxygen probes will also be added to improve oxygen control.
- The estimated energy consumed by the proposed system will be 570,000 kW-hr per year

Energy-Efficiency Improvements

- Fine bubble diffusers provide for a decreased actual oxygen requirement (AOR) to standard oxygen requirement (SOR) ratio of 0.33 compared to 0.50 for coarse bubble diffusers. [2]
- Fine bubble diffusers provide an oxygen transfer efficiency (OTE) of 2 percent per foot of submergence compared to 0.75 percent for coarse bubble diffusers. [2]
- Screw compressor blowers operate with an increased wire to air efficiency of approximately 90 percent compared to positive displacement blowers which operate with a wire to air efficiency of approximately 70 percent.[3]
- The dissolved oxygen control system allows for precise control of the air flow to match the diurnal dissolved oxygen demand which will substantially decrease the power demand of the new system.
- The mixer and oxygen probe in the 4th tank will prevent continuous aeration to keep mixed liquor in suspension.

[1] July 2013 City of Weiser Wastewater Treatment Improvements Project Preliminary Engineering Report
[2] Sanitaire Diffused Aeration Design Guide.
[3] Blower curves and data from existing blowers and new Aerzan Blowers.

CONT. : TREATMENT PROCESS –AERATION SYSTEM

Conclusion

- By using a fine bubble diffused aeration system, screw compressor blowers with oxygen probes, VFDs, flow metering, a dissolved oxygen control system, and a mechanical mixer in the 4th tank with oxygen probe, the City will reduce the required air demand of the aeration system by approximately 38.5 percent.

- **GPR Costs:**

Equipment Name	Cost
Fine Bubble Diffusers	$350,000
Screw Compressor Blowers	$430,000
Dissolved Oxygen Control System	$115,000
Mixer and Probe in 4th Tank	$75,000
Total	**$970,000**

- **GPR Justification:** Categorically GPR-eligible (Energy Efficiency) per Section 3.2-2[4]: *projects that achieve a 20% reduction in energy consumption*.

[4] Attachment 2. April 2011 EPA Guidance for Determining Project Eligibility.

2. New Pumps and Motors[5] (preliminary)

Summary

- The new W3 pumps will be lower horse power and be equipped with premium efficiency motors to conserve energy and enhance the operability of the water reuse system.
- Total Loan amount = $6,000,000
- Estimated Categorical energy efficient (green) portion of loan = 2.52% ($151,000)
- Annual Energy savings = 20%

Background

- The existing plant has two (2) 30HP W3 pumps that provide grey water and irrigation water throughout the site.

Results

- The existing 30HP W3 pumps will be replaced with two (2) 20HP premium efficiency pumps with VFDs.
- Premium efficiency motors save on average 3-7% over standard efficiency motors.
- The use of premium energy-efficiency motors and VFDs results in a power savings of 60,000 kW-hr per year and an annual cost savings of $3,600.

Energy Efficiency Improvements

- Currently one 30HP W3 pump is on all the time, providing up to 300gpm (at flows less than 300gpm, water is recycled back to the wet well).
- The standard efficiency motors currently achieve a 90% efficiency as compared to the specified premium efficient motors which are 93% efficient.
- The annual power savings was derived by calculating power use for both the existing standard efficiency 30HP motors and for the upgraded premium efficiency 20HP motors. The results are depicted in Table 1.

Table 1. Annual Power Savings

2016	GPD	Avg. HP	Efficiency	connected Power, kWh		GPD	Avg. HP	Efficiency	connected Power, kWh	
Jan	216,000	30	90%	18,493		180,000	20	93%	11,916	
Feb	216,000	30	90%	16,704		180,000	20	93%	10,763	
Mar	288,000	30	90%	18,493		252,000	21.1	93%	12,556	
Apr	216,000	30	90%	17,897		180,000	20	93%	11,531	
May	216,000	30	90%	18,493		180,000	20	93%	11,916	
Jun	288,000	30	90%	17,897		252,000	21.1	93%	12,172	
Jul	216,000	30	90%	18,493		180,000	20	93%	11,916	
Aug	216,000	30	90%	18,493		180,000	20	93%	11,916	
Sep	288,000	30	90%	17,897		252,000	21.1	93%	12,172	
Oct	216,000	30	90%	18,493		180,000	20	93%	11,916	
Nov	216,000	30	90%	17,897		180,000	20	93%	11,531	
Dec	288,000	30	90%	18,493		252,000	21.1	93%	12,556	
				217,744					142,862	
Average	1.405									
									74,883	Annual KwH Savings

- The calculated annual power savings is 74,883KwH; to be conservative 60,000KwH is the value used.
- The 20% reduction in energy consumption is calculated by dividing 60,000KwH by the existing power consumption of 220,000KwH (rounded down to 20% to be slightly conservative).
- The annual cost savings is calculated by multiplying the 60,000KwH by $0.06 per KwH = $3,600/yr.

[5] NOTE: Analysis is preliminary and will be completed when project has been awarded and actual pump & motor schedules are available

Cont.: New Pumps and Motors

Conclusion

- By using premium efficiency motors and VFDs, the City will reduce their power needs by approximately 60,000 kW-hr per year and annual power costs by approximately $3,600 each year – a 20% overall savings in energy and costs.

- **GPR Costs**:

Equipment Name	Cost
Premium Efficiency Motors	$151,000

- **GPR Justification:** Categorically GPR-eligible (Energy Efficiency) per Section 3.2-2[6]: *"projects that achieve a 20% reduction in energy consumption."*

[6] Attachment 2. April 2011 EPA Guidance for Determining Project Eligibility.

3. SCADA CONTROL TECHNOLOGY

Summary

- Energy efficiency results from the remote electronic sensing and control of the treatment plant.
- Estimated loan amount = $6,000,000
- Estimated energy efficiency (green) portion of loan ≅ 2.5% ($150,000)
- Estimated annual energy savings $11,800 per year.

Background/ Results[7]

- The SCADA system is part of the project.
- TREATMENT PLANT: The aeration system will be tied to dissolved oxygen levels in the aeration tanks and aeration header through PLC's; these control the mixer and aeration blower speed through VFDs. Thus, SCADA optimizes and controls tank oxygen levels.
- DISINFECTION: The SCADA system controls the disinfection system through flow PLC monitoring. Chlorine and dechlorination pump rates are controlled by SCADA system based on information from floats.
- PLANT: Through a computer based Graphical User Interface (GUI) program the plant's processes will be monitored and observed remotely. The SCADA GUI will also save energy through reduced travel to and from the plant.

Energy Efficiency Improvements

- TREATMENT PLANT OPERATIONS: Total plant operations are estimated to result in about $5,000 of savings per year.
- OPERATORS: Remote SCADA control saves labor and travel costs = 1 person thirty minutes each day of the year = $6,400 per year in labor costs; travel cost @ $0.51 per mile @ 2 miles = $400 per year = total saving of $6,800/yr.

Conclusion

- Total SCADA savings would be around $11,800 per year in energy, labor, and travel costs = payback of 13 years. therefore SCADA system costs are GPR-eligible by 3.5-8.
- **GPR Costs:** SCADA = $150,000
- **GPR Justification:** SCADA system costs are GPR-eligible by a Business Case per 3.5-8[8]: *SCADA systems can be justified based on substantial energy savings.*

[7] July 2013 City of Weiser Wastewater Treatment Improvements Project Preliminary Engineering Report
[8] Attachment 2. April 21, 2011 EPA Guidance for Determining Project Eligibility.